

WHAT IS CLAIMED IS:

1. A light emitting device, comprising:
 - a plurality of organic light emitting diode (OLED) modules electrically connected in series; and
 - an alternating current (AC) power source electrically connected to and
- 5 providing an AC voltage to the plurality of OLED modules.
2. A light emitting device, comprising:
 - a substrate; and
 - 10 a plurality of organic light emitting diode (OLED) series groups provided on the substrate, each OLED series group comprising a plurality of OLED modules, the OLED modules of each OLED series group electrically connected in series, wherein the OLED modules emit light upon application of an AC voltage.
- 15 3. The light emitting device of claim 2, further comprising:
 - 15 at least one first conducting line provided on the substrate, the at least one first conducting line electrically connected to a first end of each OLED series group; and
 - 20 a second conducting line provided on the substrate, the second conducting line electrically connected to a second end of each OLED series group opposite the first end.
- 25 4. The light emitting device of claim 3, further comprising:
 - 25 a converting circuit that converts an applied AC voltage with a sinusoidal waveform to a converted voltage waveform, and applies the converted voltage waveform to the at least one first and the second conducting lines.
5. The light emitting device of claim 4, wherein the converting circuit comprises back-to-back zener diodes, and the converted voltage waveform is a clipped sine wave.

6. The light emitting device of claim 4, wherein the converted voltage waveform has a first time period during which the voltage is positive and a second time period during which the voltage is negative, and the first time period is
5 approximately equal to the second time period.

7. The light emitting device of claim 4, wherein the converting circuit comprises an oscillator that provides a driving frequency of the converted voltage waveform, where the driving frequency is different than a frequency of the
10 sinusoidal waveform.

8. The light emitting device of claim 7, wherein the converted voltage waveform is a square pulse waveform.

15 9. The light emitting device of claim 7, wherein the converted voltage waveform has a frequency greater than about 10 kHz.

10. The light emitting device of claim 3, further comprising:
an alternating current (AC) power source, electrically connected to and
20 providing an AC voltage to the first and second conducting lines.

11. The light emitting device of claim 3, wherein the plurality of OLED series groups are arranged in rows of OLED modules.

25 12. The light emitting device of claim 3, wherein each OLED module comprises a respective anode and cathode, the OLED modules of each OLED series group serially connected anode to cathode.

13. The light emitting device of claim 12, further comprising:
30 a plurality of circuit elements, each circuit element electrically connected in parallel with a respective OLED module.

14. The light emitting device of claim 13, wherein each of the circuit elements comprises a resistor, diode or varistor.

5 15. The light emitting device of claim 13, wherein each of the circuit elements provides for fault tolerance of a respective OLED module.

10 16. The light emitting device of claim 12, further comprising:
a plurality of circuit elements, each circuit element electrically connected in parallel with a respective more than one OLED module.

15 17. The light emitting device of claim 12, further comprising:
a plurality of circuit elements, each circuit element electrically connected in series with a respective OLED module.

18. The light emitting device of claim 17, wherein each of the circuit elements modifies the voltage across a respective OLED module.

20 19. The light emitting device of claim 3, wherein the plurality of OLED series groups are arranged as part of a sign.

25 20. The light emitting device of claim 3, wherein the series groups are arranged such that the first ends of the series groups have alternating polarity with respect to each other.

21. The light emitting device of claim 11, wherein the series groups are arranged such that the first ends of the series groups have alternating polarity with respect to each other.

30 22. The light emitting device of claim 3, wherein each OLED module comprises:

a first electrode;
at least one organic light emitting layer over the first electrode;
a second transparent electrode over the at least one organic light emitting layer.

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23. The light emitting device of claim 22, wherein the second electrode comprises indium tin oxide.

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24. The light emitting device of claim 10, wherein the AC power source provides a voltage with a sinusoidal waveform.

25. The light emitting device of claim 10, wherein the AC power source provides a voltage with a square pulse waveform.

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26. A method of operating the light emitting device of claim 3, comprising: providing an AC square pulse waveform voltage to the at least one first and the second conducting lines.

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27. A method of operating the light emitting device of claim 26, wherein the AC square pulse waveform voltage has a first time period during which the voltage is positive and a second time period during which the voltage is negative, and the first time period is approximately equal to the second time period.

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28. A method of operating the light emitting device of claim 14, comprising: providing an AC square pulse waveform voltage to the at least one first and the second conducting lines.

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29. A method of making a light emitting device comprising:
providing a substrate;
forming a plurality of organic light emitting diode (OLED) series groups on the substrate, each OLED series group comprising a plurality of OLED

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modules, the OLED modules of each OLED series group electrically connected in series, wherein the OLED modules emit light upon application of an AC voltage.

30. A method of making a light emitting device comprising:
5 providing a substrate;
forming a first conducting material over the substrate;
forming an organic light emitting material over at least part of the first electrode material;
forming a second conducting material over at least part of the organic light emitting material; and
10 patterning the first conducting material, organic light emitting material, and second conducting material to form a plurality of organic light emitting diode (OLED) modules, each OLED module having a first electrode formed from the patterned first conducting material, a light emitting layer formed from the organic light emitting material, and a second electrode formed from the patterned second conducting material, the first and second electrodes of respective OLED modules electrically connected to electrically connect the OLED modules in series.

31. The method of claim 30, wherein the first conducting material comprises a
20 conducting material which is transparent to light emitted by the light emitting device.

32. The method of claim 31, wherein the first conducting material comprises indium tin oxide.

25 33. The method of claim 30, wherein the forming the first conducting material comprises:
forming a first conducting electrode material; and
forming a first conducting interconnect material.

34. The method of claim 33, wherein the patterning the first conducting material comprises:

patterned the first conducting electrode material to form the first electrodes; and

5 patterning the first conducting interconnect material to form respective interconnects electrically connected to the respective first electrodes.

35. The method of claim 33 wherein the patterning the second conducting material forms respective second electrodes electrically connected to respective 10 interconnects.

36. The method of claim 30, wherein the forming the first conducting material comprises sputtering at least part of the first conducting material.

15 37. The method of claim 30, wherein the patterning the first conducting material comprises etching the first conducting material.

38. The method of claim 30, wherein the forming and patterning the first conducting material comprises:

20 selectively depositing the first electrode material.

39. The method of claim 30, wherein the first conducting material is a single material.

25 40. The method of claim 33, wherein the forming the first conducting interconnect material comprises:

sputtering the first conducting interconnect material.

41. The method of claim 30, wherein the forming and patterning the organic 30 light emitting material comprises:

evaporating the organic light emitting material through a shadow mask.

42. The method of claim 30, wherein the forming and patterning the organic light emitting material comprises:

5 depositing the organic light emitting material over the substrate; and
 etching the deposited organic light emitting material to form the light emitting layer.

43. The method of claim 30, wherein the forming and patterning the organic light emitting material comprises:

10 selectively depositing the organic light emitting material over the substrate to form the light emitting layer.

44. The method of claim 30, wherein the forming and patterning the second conducting material comprises:

15 evaporating the second conducting material through a shadow mask.

45. The method of claim 30, wherein the forming and patterning the second conducting material comprises:

20 depositing the second conducting material over the substrate; and
 etching the deposited second conducting material.

46. A display comprising:

25 a plurality of organic light emitting diode (OLED) modules arranged to spell out at least one letter or depict an image.

47. The display of claim 46, wherein each OLED module has the shape of a letter or image.

30 48. The display of claim 46, wherein plurality of OLED modules is grouped into a plurality of series groups, the OLED modules of each series group electrically connected in series.

49. The display of claim 48, wherein each OLED module has the shape of a letter or image.

5 50. The display of claim 46, wherein plurality of OLED modules are electrically connected in parallel.

51. A method of making a display comprising:
providing a substrate; and

10 arranging a plurality of organic light emitting diode (OLED) modules to spell out a letter or depict an image.